Process Manufacturing, Recreational vehicles and Laboratory Industry Reference Committee (IRC)

PMB Plastics, Rubber and Cablemaking Training Package

IRC Skills Forecast and Proposed Schedule of Work 2017-2021

June 2017

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Innovation & Business Skills Australia

Prepared on behalf of the Process Manufacturing, Recreational Vehicle and Laboratory Operations IRC for the Australian Industry Skills Committee (AISC)

IRC Skills Forecast and Proposed Schedule of Work 2017-2021

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IBSA also acknowledges the September 2016 Four Year Work Plan, produced by Manufacturing Skills Australia (MSA), on which this version is based.

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Contents

Executive Summary

The Australian Polymer Processing (previously known as Plastics, Rubber and Cablemaking) Industry Skills Forecast and Proposed Schedule of Work, links the sector trends, workforce skill priorities and training plan to effectively meet the future skill needs of this sector in transition by:

- providing an understanding of the industry including its primary activities, its size and sub sectors, type and location of employers, and opportunities and challenges *(Sector Overview);*
- outlining the critical workforce challenges and opportunities *(Employment)*;
- forecasting future skills priorities by describing trends in workplace and job design *(Skills Outlook)*; and
- proposing and prioritising training product development and review activities (*Training Product Review Plan)*.

This June 2017 update to the Polymer Processing – Plastics, Rubber and Cablemaking Industry Skills Forecast and Proposed Schedule of Work augments the earlier work plan submitted in September 2016 with an executive summary, incorporation of updated priorities for training product development and review following recent consultations with the Process Manufacturing, Recreational Vehicles and Laboratory Industry Reference Committee and State Training Authorities.

What is the polymer processing industry?

The polymer processing industry is a downstream industry to the chemical and petrochemical industries, sourcing both polymer raw materials and many of the additives from these sectors. The outputs from this industry (including plastics, rubber and cables) are used directly in almost all other industries and as components in many consumer products.

Victoria and New South Wales are the major hubs for polymer processing in all industry sectors excepting “Other polymer product manufacturing sector” where Queensland has slightly more enterprises than Victoria and New South Wales.

Most polymer processing businesses are small or micro businesses. The rigid and semi-rigid polymer product manufacturing sector has the most businesses and is also served by two large well-known companies, Pratt Holdings and Pact Group Holdings.

While there are no general licensing issues, licensing arrangements are consistent with relevant legislation and regulations applying in each State and Territory.

Critical workforce challenges and opportunities

Stakeholder feedback identified workforce supply side challenges including:

- lack of qualified staff on the shop floor. A major challenge is attracting apprentices. To lift the profile of the industry to encourage more applications for training and for roles in the industry. There is a potential to work with schools to attract more entrants;
- STEM (science, technology, engineering and mathematics) skills and foundation, language, literacy and numeracy skills are essential prerequisites for most new industry roles and may limit the pool of people able to undertake polymer processing qualifications;

- limited availability of training in PMB qualifications and limited opportunities for training providers to customise training for individual employers. Enterprises often prefer to train their own staff rather than seek external training with associated qualification recognition and portability issues. In recent years, only 24 training providers had scope to deliver PMB qualifications with a total of around 1,867 enrolments, with this number trending down. This number has decreased over the last couple of years. Only one provider, in New South Wales, had scope to deliver the Advanced Diploma; and
- cheap imports, robotics and automation have the potential to reduce demand and change the roles and skills required of polymer processing workers in Australia.

Stakeholders identified opportunities including:

- utilise synergies between the polymer processing and metals industry in some areas such as welding, machine operations, tool making, fitting and design to address polymer processing staffing and skill shortages;
- recruit educated migrants and/or overseas recruitment of appropriately skilled staff where local staff are not available;
- leverage the National Innovation and Science Agenda (NISA) initiative;
- create new, sustainable and environmentally friendly products to both increase demand for the industry's products and improve the industry's image
- implement advanced manufacturing processes (such as 3D printing) and use advanced materials.

Robotics and automation, while a challenge in terms of employment numbers, is also an opportunity that could lead to more interesting, demanding and higher skilled roles for future polymer processing workers.

Forecasting skills priorities

The skills priorities have been informed by international and national trends and stakeholder feedback.

3D printing (additive manufacturing) is the major international trend expected to impact the polymer processing industry. In addition to learning to use new machinery, the workforce will need to be more highly and flexibly skilled.

Workers will need sound foundation skills and various STEM skills including design and coding skills.

Computer literacy skills are considered essential.

Workers will also need in-depth materials knowledge as well as understanding how the technology operates.

Workers will need to be able to problem solve in a technical environment.

Some new techniques require enormous amounts of specific knowledge. Some workers will need the capacity to develop and apply this knowledge.

To support innovative business changes while ensuring compliance with national and international standards, there is likely to be an increased demand for workers and enterprises to adopt business practices such as Lean, 5 S and Six Sigma.

Stakeholders identified innovative uses for plastics, the Internet of Things, introduction of Circular Economy concepts and product provenance management (including tracing material sources) as being major trends that will impact on the future of the industry and its workforce.

Training Package priorities

The Training Package Review Plan 2017-18 to 2020-21 was developed by the IRC with support from IBSA Manufacturing based on identified industry trends. This plan lists the priorities over the next four years, the rationale for these priorities, and the proposed scope and timeframes for these activities.

The items identified as critical and proposed for inclusion as a priority for the 2017-2018 schedule of work is to develop a case for change.

Administrative Information

Name of Industry Reference Committee (IRC): Process Manufacturing, Recreational Vehicles and Laboratory IRC

Name of Skills Service Organisation (SSO): Innovation & Business Skills Australia (IBSA Manufacturing)

Sector Overview

Polymer processing - Snapshot of the industry

The Australian polymer processing (previously known as plastics, rubber and cablemaking) industry is a downstream industry to the chemical and petrochemical industries, sourcing both polymer raw materials and many of the additives from these sectors. Other additives, such as fillers, may be sourced from the minerals sector. The outputs from this industry are used directly in almost all other industries and as components in many consumer products.

The major hubs for the polymer manufacturing industry are located in:

- Victoria
- New South Wales.

There are five qualifications in the PMB Plastics, Rubber and Cablemaking Training Package ranging from Certificate II to Advanced Diploma level.

- PMB20116 Certificate II in Polymer Processing
- PMB30116 Certificate III in Polymer Processing
- PMB40116 Certificate IV in Polymer Technology
- PMB50116 Diploma of Polymer Technology
- PMB60116 Advanced Diploma of Polymer Technology

The following Australian and New Zealand Standard Industrial Classification (ANZSIC) codes cover businesses in this industry:

- Subdivision 18 Group 182 Basic Polymer Manufacturing
- Subdivision 19 Polymer Product and Rubber Product Manufacturing

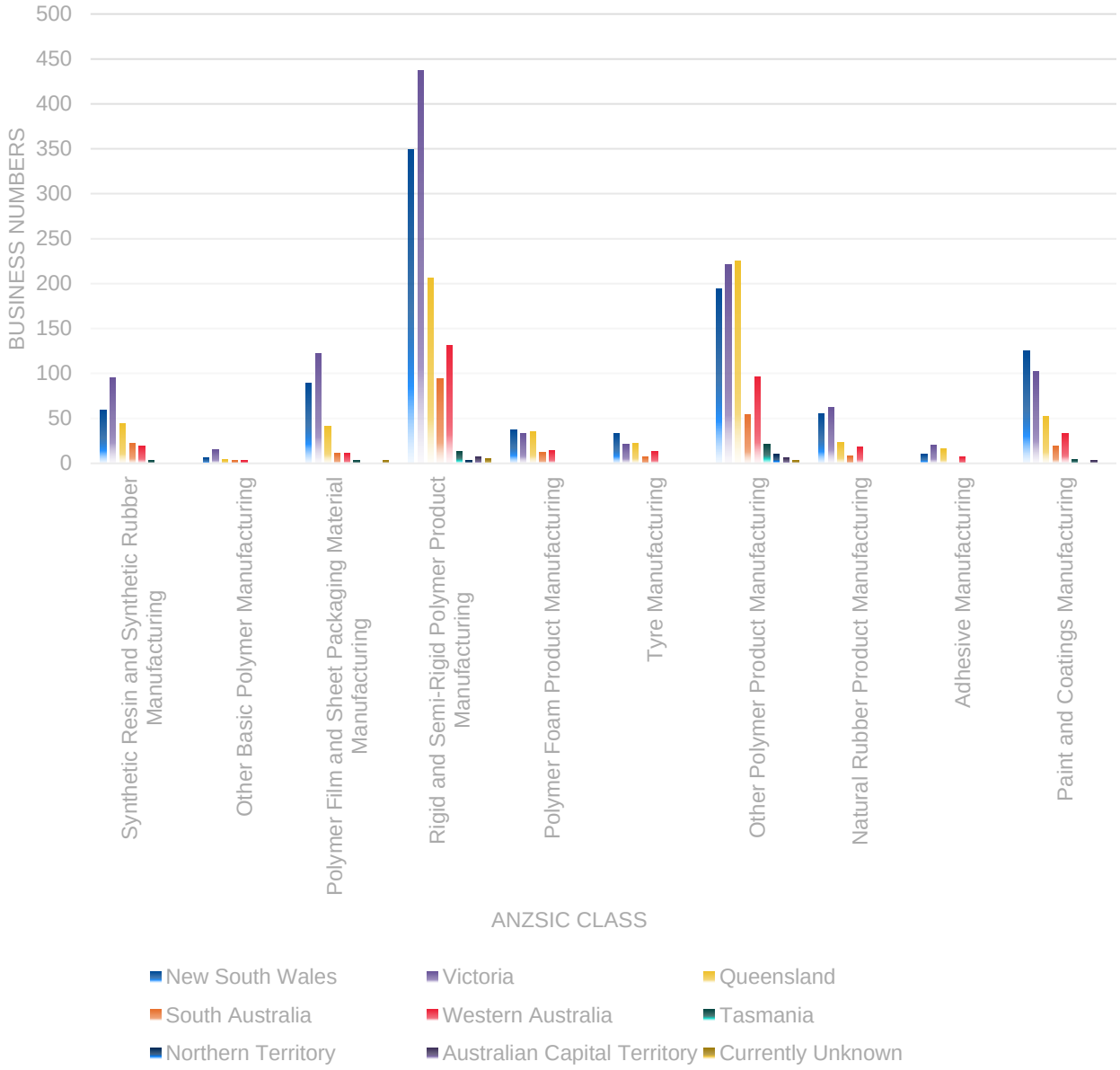
Business numbers and size

The industry profile is a little different from other industry profiles in manufacturing, in that Victoria is home to more than 50% of businesses in most sectors. There are some exceptions, for example, Queensland has the largest number of businesses operating in the 'Other polymer product manufacturing' sector.[1]

Note: Businesses have been classified according to the number of employees.

[1] Australian Bureau of Statistics, 2016, Counts of Australian Businesses, including entries and exits, 2014-15

Polymer processing industry, Australia
Businesses by state and ANZSIC class 2015



Source: ABS, Counts of Australian Businesses, June 2015

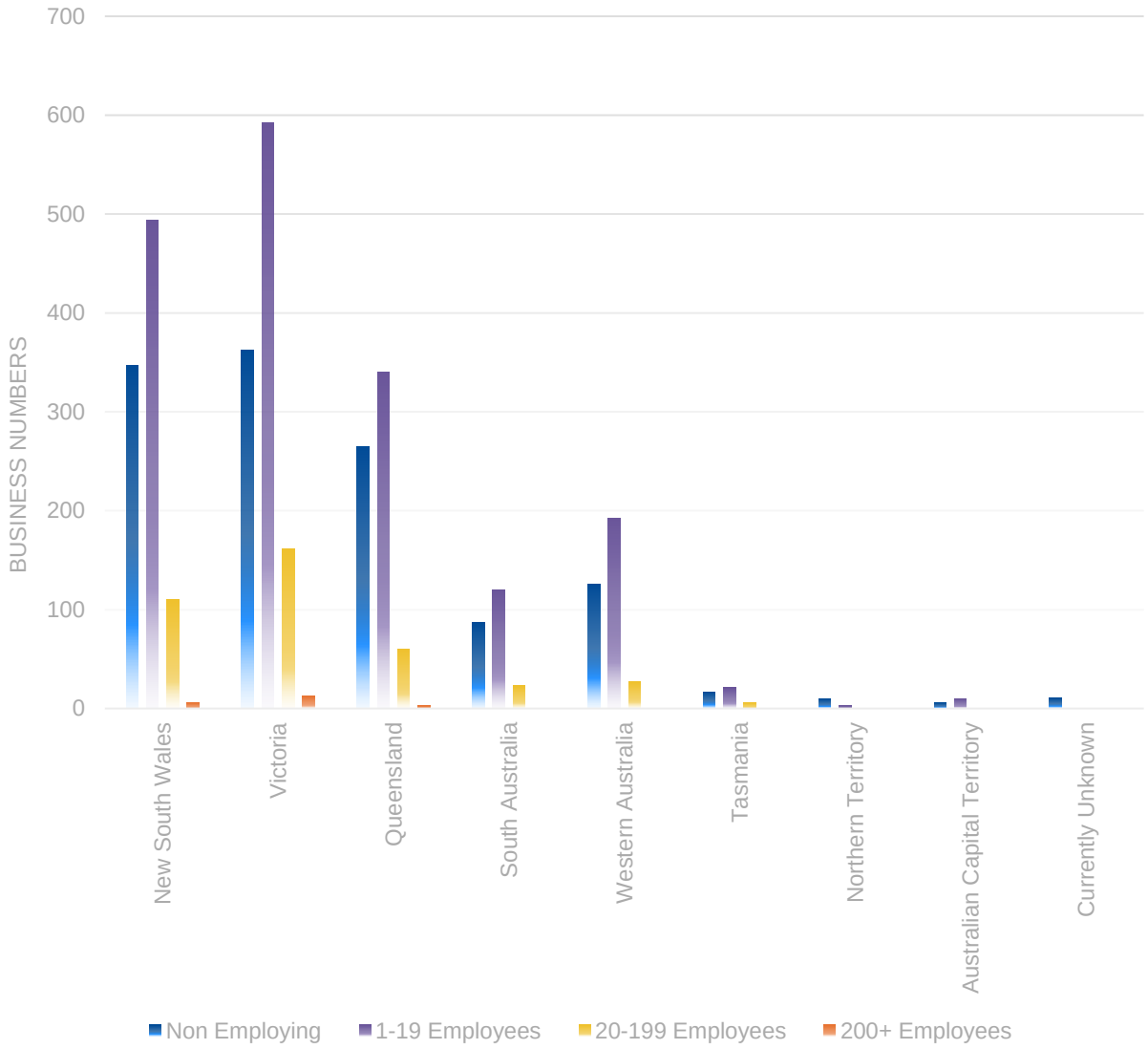
The major manufacturing sector in this industry group is rigid and semi-rigid polymer product manufacturing. Two of the largest companies in this sector are Pratt Holdings which operates through its subsidiary, Visy Industries, and Pact Group Holdings. It is estimated that these two companies account for over 75% of the market. Visy Industries is Australia's largest manufacturer of PET products.[2]

[2] IBISWorld, 2015, Plastic Blow Moulded Product Manufacturing in Australia; Plastic Injection Moulded Plastic in Australia

New tyres are no longer manufactured in Australia. However, there is still a significant tyre re-treading industry and there are several companies operating in this area. Rema Tiptop Australia provides services in this area to the resources industry and has been actively involved in Training Package development.

The majority of businesses in the industry are small businesses (1-19 employees) (52%) with micro (non-employing businesses accounting for a further 36%. Victoria had the most number of businesses operating at the end of June 2015 (1,128) of which 52% were small businesses.[3]

Polymer processing industry, Australia
Businesses by state and number of employees June 2015



Source: ABS, Counts of Australian Businesses, 2016

[3] Australian Bureau of Statistics, 2016, Counts of Australian Businesses, including entries and exits, 2014-15

Licensing, regulatory or industry standards

There are no general licensing issues, however specific licenses may be required in some jobs. The local regulations should be checked for details.

The industry is generally subject to a range of regulatory controls. These vary with the nature of the facility and to some extend on its location as most regulations are State based and many are enforced by local government. The PMB Training Package allows for these differences without mandating them to specific units of competency which would not be appropriate.

An example of a regulation relevant to the industry is the Dangerous Goods Act and related regulations. Hazardous materials may also be used and relevant workplace, health and safety standards apply as per the jurisdiction. Good operating practices adopted within the workplace may be defined by industry codes of practice and government regulations.

Challenges and opportunities in the sector/sub-sector at the international/national/jurisdictional or regional level

Stakeholders identified the following potential challenges and opportunities facing the polymer processing industry.

Challenges:

- Robotics and automation
- Cheap imports
- Supply of skills
- Apparently low uptake of qualifications
- Lack of a training culture in the industry
- STEM skills
- Foundation skills
- Language, literacy and numeracy (LLN) skills

Opportunities:

- National Innovation and Science Agenda (NISA)
- Advanced manufacturing/advanced materials
- Creation of sustainable and environmentally friendly products
- Robotics and automation

Stakeholders agreed that a major challenge facing the industries is the impact of the VET reform process on training. The lack of providers has been identified by stakeholders as the main contributor to the low uptake of qualifications and shortage of skilled workers. The industry is concerned that the lack of training and skilled workers is hampering the ability of the industry to take advantage of any opportunities that arise. Reliance on imported workers or educated migrants with the required skills has been reported by stakeholders as their solution to the challenge. Labour mobility is also seen as an important factor in the future success of the industry.

While stakeholders agreed the National Innovation and Science Agenda could offer opportunities, they are unsure as to how exactly they can tap into these opportunities given the difficulty attracting suitably skilled workers.

There were potential synergies identified by stakeholders between the metal manufacturing industry and this industry in areas such as operating machines, using tools, fitting and tool making, welding and design, including industrial design. However, all agreed that both industries are struggling to meet current skill needs in these areas.

The Defence White Paper was suggested as a possible opportunity in response to stakeholders comments that "White papers never really filter down to the SMEs (small and medium enterprises) of this world".

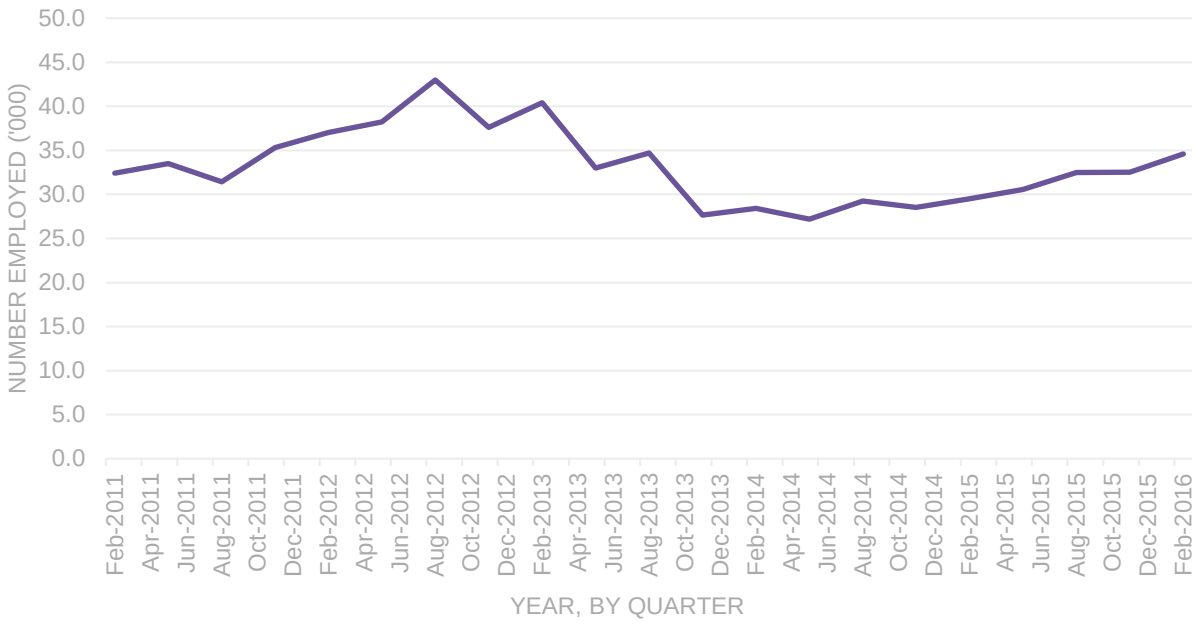
Employment

Employment outlook

According to IBISWorld reports [4], the polymer processing industry in Australia is in decline. The sector struggles against cheap imports and the rise of alternate packaging materials. Over the past five years, the number of businesses operating in the 'Polymer Product and Rubber Product Manufacturing' sector has decreased by 8%, from June 2011 to June 2015 [5], although in some cases this can be attributed to consolidation.[6]

Stakeholders report that employment is cyclical, with the industry operating in a boom-and-bust scenario. This is reflected in employment statistics where, as displayed in the table below, it can be seen that employment has fluctuated over the past five years. Currently the total number employed sits slightly higher than it did five years ago. There are some positive signs for the industry with a major manufacturer and supplier recently 'onshoring' its manufacturing following the acquisition of new technology which will treble its output. The move has been supported by the drop in the value of the Australian dollar.[7]

Polymer Product and Rubber Product Manufacturing, Employed persons, total



Source: Australian Bureau of Statistics, 2016. 6291.0.55.003 Labour Forces, Australia, Detailed, Quarterly

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[4] IBISWorld, 2015-16. Report numbers C1821, C1911, C 1912a, C1912b, C1913, C1919a, C1919b, C1920 and C2431.

[5] Australian Bureau of Statistics, 2015. 81650 Counts of Australian Businesses, including Entries and Exits, Jun 2011 to Jun 2015

[6] IBISWorld, 2015. C1912a Plastic Blow Moulded Product Manufacturing in Australia Industry Report. http://www.ibisworld.com/

[7] Sligar, David, 2016, Is Onshoring the Future of Australian Manufacturing?, *Industry Update*, August 30, http://www.industryupdate.com.au/article/onshoring-future-australian-manufacturing

The only sector that is relatively stable is the plastics recycling sector. This sector is benefiting from changing consumer behaviours as more people strive to minimise their impact on the environment. Other sectors of the industry are exploring alternate materials such as 'bio plastics'. The use of bioplastics is predicted to increase by 10 to 30 percent by 2020.[8]

Workforce supply-side challenges and opportunities

Stakeholders report that the polymer processing industry is lacking qualified staff on the shop floor. Businesses are looking to either educated migrants or overseas to recruit appropriately skilled staff. The lack of skilled staff is hampering efforts to take advantage of advanced manufacturing/robotics/automation as basic knowledge and skills requirements such as STEM and foundation skills must be addressed first. The industry identified that there are synergies between the polymer processing industry and the metals industry in some areas such as welding, machine operations, tool making, fitting and design.

A major challenge identified by the industry is attracting apprentices. One national association reported that they advertised for apprentices nationally and only attracted three applicants. All stakeholders questioned whether there was potential to "do more with schools" to promote pathways for new entrants to the industry. One important challenge in attracting new entrants is the need to change the image of the industry from one that is of a "bad, dirty industry" to one that is clean, modern, and innovative. Stakeholders proposed that initiatives which encourage school careers advisers, students and their parents to "discover manufacturing" be encouraged as these have previously had some positive results.

Many enterprises prefer to train their own staff rather than seek training externally. This is because they have found it difficult to obtain the customised training that they require. Stakeholders identified that there is a need to be able to bring together various elements from a variety of Training Packages to meet the needs of individual enterprises, for example, design + engineering + materials/raw materials knowledge. This is currently difficult because jurisdictional funding constraints for public institutions and most private RTOs are too small to be able to accommodate the range of units of competency.

Despite this feedback, enrolments in qualifications from the PMB Training Package have remained stable over the past five years (see table below). Furthermore, figures presenting Total VET Activity (TVA) show a total of 1,863 enrolments in PMB qualifications in 2014, one third more enrolments than publicly funded alone.

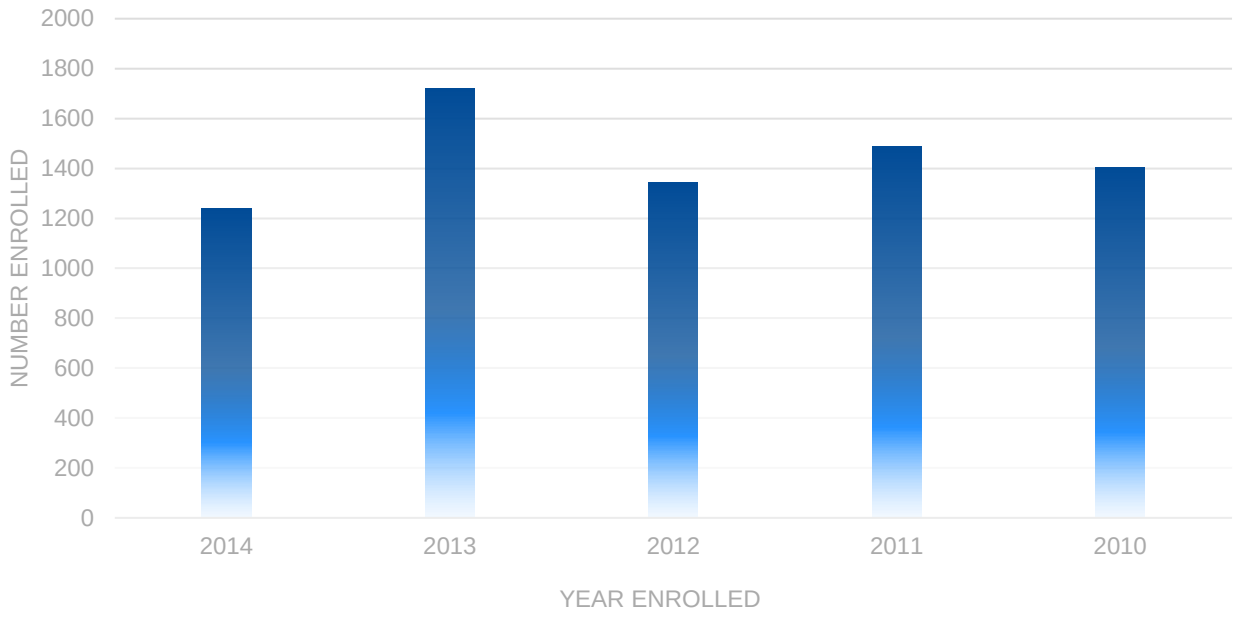
The ability for industry to source and train new workers is further hindered by availability of training. There is a total of 24 Registered Training Organisations (RTOs) with PMB qualifications on scope. This is a decrease from numbers seen in the past couple of years, particularly as public providers are dropping qualifications from scope. Most noticeably the Certificate II and III, as well as Diploma level qualifications. The Advanced Diploma is only on scope with one RTO, located in New South Wales.

[8] Science Learning, 2013, Bioplastics, University of Waikato, May 16, http://sciencelearn.org.nz/Innovation/Innovation-Stories/Biospife/Articles/Bioplastics

Another factor which may impact delivery of qualifications in this sector is the restructure and amalgamation of the TAFE providers in Western Australia [9] and New South Wales[10]. As a result of the amalgamation, the number of providers in these states will be halved and training provision 'rationalised'. (As at May 24, 2016, there were no public providers with scope in Western Australia.)

Note: Completion data has not been included as initial analysis of the data shows very low completion rates. This may be skewed by the fact that enrolment in the public system is set up to capture only full qualification enrolments, even if the participant only intends to do a Unit of Competency or a Skill Set. The introduction of the Unique Student Identifier (USI) may provide data that will permit better identification on cohort outcomes and student pathways.

Enrolments: PMB07 - Plastics, Rubber and Cablemaking



Source: VOCSTATS http://www.ncver.edu.au/resources/vocstats.html, Program enrolments, accessed April 2016

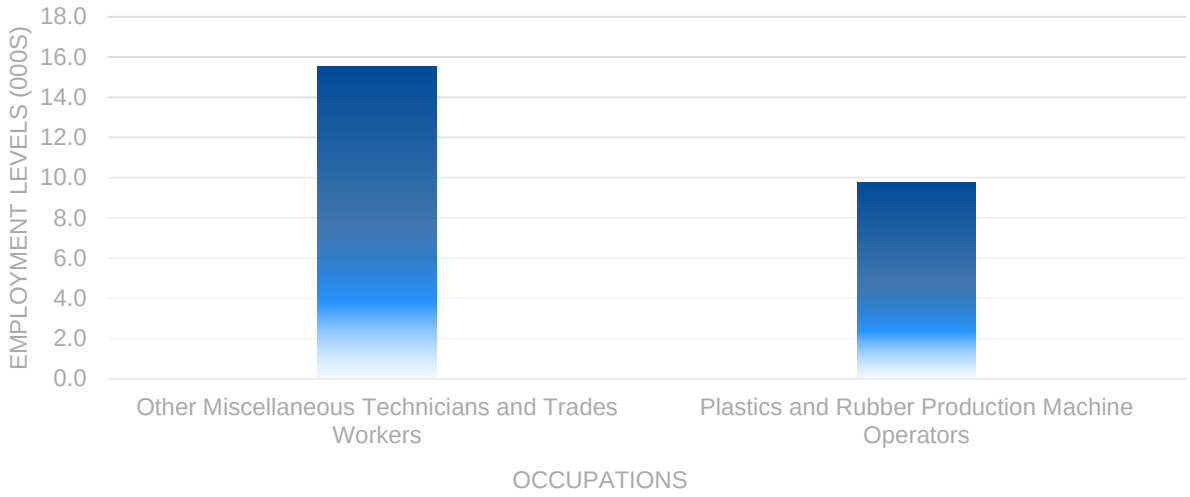
Additional information

The following graphs have been supplied by the Department of Education and Training. The Department has sourced national occupation-related data from the Department of Employment and the Australian Bureau of Statistics to inform the work of the IRCs.

[9] Department of Training and Workforce Development, 2016, Changes to TAFE in Western Australia, http://www.dtwd.wa.gov.au/trainingproviders/training-sector-reform-project/Pages/changes-TAFE-WA.aspx

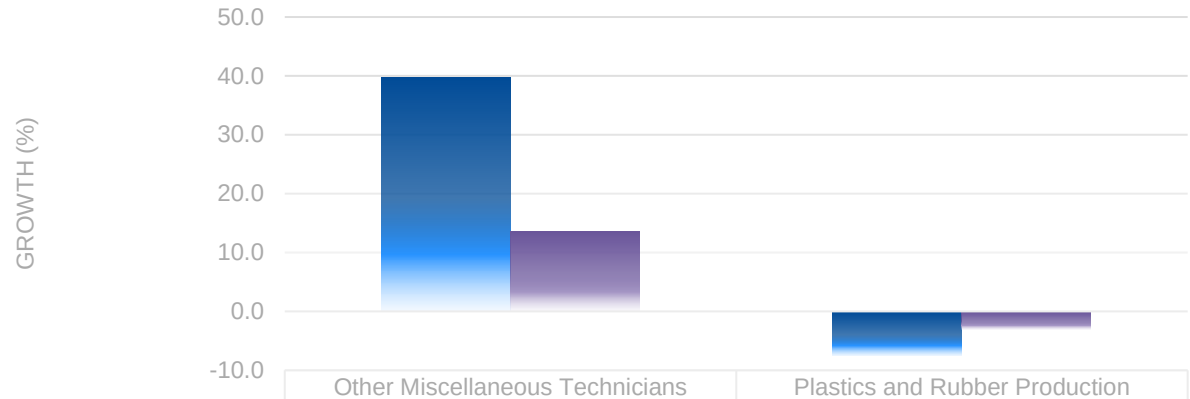
[10] NSW TAFE Commission, 2016, A Vision for TAFE NSW, https://www.tafensw.edu.au/__data/assets/pdf_file/0016/22570/a-vision-for-tafe-nsw.pdf

Key Occupations – Employment Levels (000s)[11]



Source: Australian Bureau of Statistics (ABS)

Key Occupations – Historical and Projected Employment Growth (%)[12]



	Other Miscellaneous Technicians and Trades Workers	Plastics and Rubber Production Machine Operators
Historical Growth (%)	39.8	-7.6
Projected Growth (%)	13.6	-3.1

Source: Historical employment growth from the Australian Bureau of Statistics (ABS) and projected employment growth from the Department of Employment.

[11] Note: Occupations are at the four digit ANZSCO code. Employment levels are the five year annual average to 2015. Figures include all employed in the occupation across the economy, not just the relevant industry.

[12] Note: Occupations are at the four digit ANZSCO code. The historical employment is the five year growth rate to 2015 and the projected employment growth rate is the expected growth rate to 2019. Rates are based on figures that include all employed in the occupation across the economy, not just the relevant industry.

IRC analysis

Data provided in the graphs above represent Key Occupations as determined by the Department of Employment. The first graph above, showing a five year annual average, does not give much scope for comment. Without seeing year on year changes, it can be difficult to comment on industry and economic influences that may cause fluctuations in employment.

The second graph includes projections on employment figures to 2019. the following table was provided to the IRC, utilising data from the Department of Employment [13], in order to include Group 8392 Plastics and Rubber Factory Workers. This data shows projected employment growth to November 2020. These employment projections do not match the current trajectory of employment being on the rise, as displayed in the graph on page 10. A negative growth in employment also does not match stakeholder feedback, who describe their search for suitably skilled workers as the greatest issue, not the lack of work available.

Occupation Code	Occupation	Employment level - November 2015 ('000)	Department of Employment Projections		
			Projected employment level - November 2020 ('000)	Projected employment growth - five years to November 2020	
				('000)	(%)
3999	Other Miscellaneous Technicians and Trades Workers	18.6	17.6	-1.1	-5.7
7115	Plastics and Rubber Production Machine Operators	9.0	8.1	-0.9	-9.7
8392	Plastics and Rubber Factory Workers	3.6	3.5	-0.1	-3.0

[13] Department of Employment, 2016 Employment Projections. Occupation projections. http://lmip.gov.au/default.aspx?LMIP/EmploymentProjections Accessed July 2016.

Skills outlook

International and national trends

3D printing/additive manufacturing is the major international trend that is expected to impact the industry. Stakeholders are divided on how this will impact the skill needs of the industry, with some stakeholders seeing it affecting skills at the operator level (new machinery) and others seeing a need for higher level skills in areas such as materials knowledge and design and coding skills. However, unless the industry is able to improve the foundation skills of its workforce, there will be little opportunity to take advantage of this technology.

There are significant new techniques coming from the United States which require an enormous amount of specific knowledge. These techniques may combine the use of 3D printing and traditional plastics manufacturing techniques[14] or the use of traditional materials such as PVC with 3D printing [15]. Industrial design is seen as an emerging skills area for the industry as the future of the industry lies in innovative uses for plastics.

Computer literacy skills are also considered essential as stakeholders identified that the Internet of Things (IoT) and the circular economy[16][17] are also major trends that will influence the future of the industry. Automation and robotics are also another international trend impacting the industry. [18] Increasingly the technology used is becoming more sophisticated and automated with operators needing to have significant depth of materials knowledge as well as understanding how the technology operates. This is driving an increasing need for operators who can problem solve in a technological environment.

Nationally, stakeholders are reporting an increased demand for the adoption of business practices such as Lean, 5 S, Six Sigma, etc. These practices reflect the industry's drive to adopt innovative and 'advanced' manufacturing strategies to ensure the longevity and sustainability of the industry.

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[14] Liverani, S., 2016, Video: Computational thermoforming – the cheaper alternative to 3-D printing, The American Ceramic Society, http://ceramics.org/ceramic-tech-today/video-computational-thermoforming-the-cheaper-alternative-to-3-d-printing

[15] Balinski, B., 2016, World-first Australian 3D printing material announced, Manufacturers' Monthly http://www.manmonthly.com.au/news/world-first-australian-3d-printing-material-announ

[16] Hepler, L., 2015, GreenBiz 101: Defining the circular economy, GreenBiz 101, https://www.greenbiz.com/article/defining-circular-economy-beyond-recycling-material-reuse

[17] McKinsey & Company, 2016, Rethinking the future of plastics, http://www.mckinsey.com/business-functions/sustainability-and-resource-productivity/our-insights/rethinking-the-future-of-plastics?cid=other-eml-cls-mip-mck-oth-1606

[18] Manufacturers' Monthly, 2016, Plastic injection moulding company automates manufacturing processes with robots, August 29, http://www.manmonthly.com.au/news/plastic-injection-moulding-company-automates-manufacturing-processes-robots/

Sector skills

The five most important skills for the sectors workforce within the next three to five years.

Rank	Skill	How identified
1	Foundation skills including problem solving in a technological environment	Industry consultations
2	Design and coding skills	Industry consultations
3	Materials knowledge and provenance	Industry consultations
4	Digital literacy/IT skills	Industry consultations
5	Business process skills – Lean/5S/Six Sigma, etc	Industry consultations

Generic workforce skills[19]

Ranked from 1 being the most important to 12 being the least important.

1	LLN
2	Design mindset / Thinking critically / System thinking / Solving problems
3	Learning agility / Information literacy / Intellectual autonomy and self-management
4	Technology
5	STEM
6	Data analysis
7	Managerial / Leadership
8	Communication / Virtual collaboration / Social intelligence
9	Environmental and Sustainability
10	Customer service / Marketing
11	Entrepreneurial
12	Financial

[19] Pre-populated table supplied by the Department of Education and Training

Training Product Review Plan – 2017-2021

In September 2016 Stakeholders identified a range of training product items that need to be considered in the Training Product Review Plan.

The IRC Skills Forecast and Proposed Schedule of Work 2017-18 to 2020-2021 table provided at the end of this document lists the priorities for the next four years. This table also provides the rationale for these priorities, the proposed scope and timeframes for these activities.

Items identified as time critical and to be included in the priorities for 2017-18

The items identified as critical and proposed for inclusion as a priority for the 2017-2018 schedule of work is to develop a Case for Change.

Additional factors to consider

In September 2016, stakeholders acknowledged that most of the skills are in the current Training Package, such as:

1. Materials knowledge;
2. Polymer converting process and converting equipment knowledge;
3. Problem solving skills;
4. Workplace Health and Safety knowledge.

However, feedback indicates the need to ensure that they reflect current industry needs. Any new skills identified as priorities should build on these and complement current knowledge and skills. This includes the addition of skills and knowledge around additive/advanced manufacturing.

IRC Signoff

This work plan was agreed as the result of a properly constituted IRC decision and was approved by the IRC in June 2017.